SECTION II (Remarks)

Response to the §103 Rejection of Claims

In the May 28, 2004 Office Action, the Examiner finalized the rejections of pending claims 38-60, 62, and 64-69 under 35 U.S.C. §103(a) as being unpatentable over **Satoh** et al. U.S. Patent No. 5,757,061 (hereinafter "Satoh") in view of **Roeder** et al. Liquid Delivery MOCVD of Ferroelectric PZT, MAT. RES. SYMP. PROC., Vol. 415, pp. 123-128 (1996) (hereinafter "Roeder") and **Miller** U.S. Patent No. 3,805,195 (hereinafter "Miller").

In response, Applicants have cancelled claims 59, 64, and 69.

Applicants hereby traverse the Examiner's rejection of claims. The patentable distinction of the pending claims over the cited reference is disclosed in the following section of the Remarks.

Patentability of Claims 38-56, 60, 62, and 65-68

Independent claims 38, 56, and 60, from which claims 39-55, 62, and 65-68 respectively depend, expressly recite:

> "establishing a correlative empirical matrix of plots of each of ferroelectric polarization, leakage current density, and atomic percent lead in PZT films, as a function of each of temperature, pressure and liquid precursor solution A/B ratio, wherein A/B ratio is the ratio of Pb to (Zr + Ti);
>
> identifying from said plots an inflection point of each plot as defining a region of operation with respect to independent process variables of temperature, pressure and liquid precursor solution A/B ratio; and
>
> conducting the liquid delivery MOCVD at temperature, pressure and liquid precursor solution A/B ratio values selected from said region of operation."

Such express claim language of claims 38-56, 60, 62, and 65-68 clearly and unequivocally requires that the correlative empirical matrix contain plots of "**each of**" (i) ferroelectric polarization, (ii) leakage current density, and (iii) atomic percent lead as a function of "**each of**" (a) temperature, (b) pressure, and

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(c) liquid precursor solution A/B ratio, as opposed to plots of "<u>any of</u>" (i)-(iii) as a function of "<u>any of</u>" (a)-(c).

Figure 2 of the instant specification shows an example of such a correlative empirical matrix as required by claims 38-56, 60, 62, and 65-68 of the present application, which is reproduced below for ease of reference:
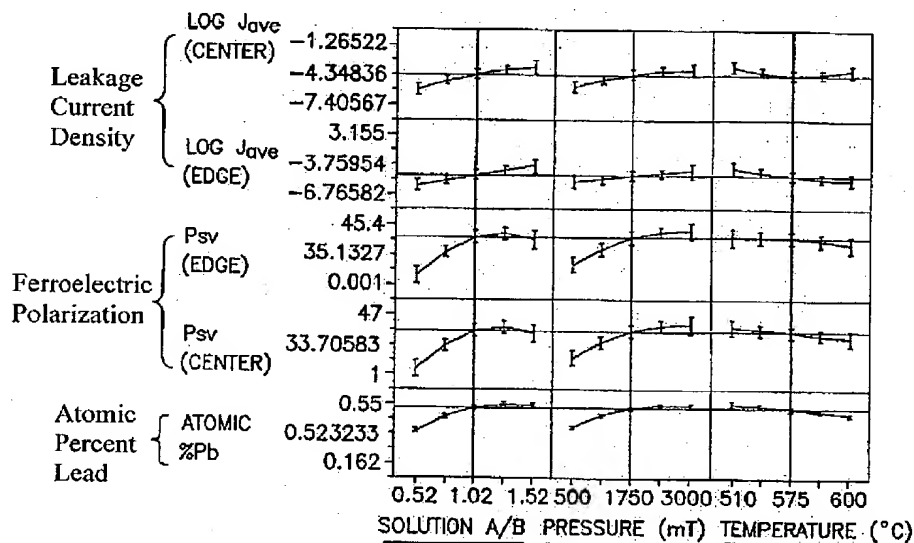
It is self-evident from the above-quoted claim language that the correlative empirical matrix required by claims 38-56, 60, 62, and 65-68 **concurrently** contains:

(1) at least one plot of <u>ferroelectric polarization</u> as a function of <u>temperature</u>;

(2) at least one plot of <u>ferroelectric polarization</u> as a function of <u>pressure</u>;

(3) at least one plot of <u>ferroelectric polarization</u> as a function of <u>liquid precursor solution A/B ratio</u>;

(4) at least one plot of <u>leakage current density</u> as a function of <u>temperature</u>;

(5) at least one plot of <u>leakage current density</u> as a function of <u>pressure</u>;

(6) at least one plot of <u>leakage current density</u> as a function of <u>liquid precursor solution A/B ratio</u>;

(7) at least one plot of <u>atomic percent lead</u> as a function of <u>temperature</u>;

(8) at least one plot of <u>atomic percent lead</u> as a function of <u>pressure</u>; **and**

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(9) at least one plot of <u>atomic percent lead</u> as a function of <u>liquid precursor solution A/B</u> <u>ratio</u>.

<u>None of the cited references Satoh, Roeder, and Miller teaches or suggests establishment of a correlative empirical matrix as required by claims 38-56, 60, 62, and 65-68 of the present application</u>.

The **Roeder** reference discloses the variation of PZT film properties as a function of <u>Zr/(Zr+Ti) ratio</u> and <u>A/B ratio</u> in the precursors (see Roeder, pages 2-3, the Results Section discussing variation of film properties as a function of Zr/(Zr+Ti), and pages 3-5, the Results Section discussing variation of film properties as a function of A/B ratio in the precursors).

However, <u>Roeder does not teach or suggest in any manner that the PZT film properties may vary as a function of temperature or pressure</u>.

Instead, **Roeder** expressly states at page 2, last paragraph and page 3, lines 1-2 that:

> "Values [of dielectric constant] are shown in Figure 2 for films deposited at 550 and 590°C. <u>The fact that the values fall along the same line indicates that the films are qualitatively similar for both deposition temperatures.</u>"
> (emphasis added)

Such statement by **Roeder** constitutes <u>an express teaching-away from adjustment of deposition temperature for optimizing PZT film properties</u>.

A person ordinarily skilled in the art, after reading such statements, would not be motivated to explore the impact of different deposition temperatures on the PZT film properties, much less be motivated to establish plots of ferroelectric polarization, leakage current density, and atomic percentage lead as a function of temperature, as required by claims 38-56, 60, 62, and 65-68 of the present application.

Further, <u>all the PZT films disclosed by Roeder were deposited at the same reactor pressure of 2 torr</u> (see Roeder, page 2, lines 2-3) without variation, indicating that <u>Roeder did not even contemplate the impact of different pressures on PZT film properties</u>.

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Therefore, **Roeder** does not provide any motivation for a person ordinarily skilled in the art to explore the impact of different pressures on the PZT film properties, much less any motivation for establishing plots of ferroelectric polarization, leakage current density, and atomic percentage lead as a function of pressure, as required by claims 38-56, 60, 62, and 65-68 of the present application.

In the May 28, 2004 Final Office Action, the Examiner asserted that "Roeder teaches to determine the user-determined variables by the plateau effect distribution" for optimizing the properties and deposition of the PZT material, that "[t]emperature and pressure, ..., are user-determined variables," and that "pressure and temperature should be determined by the plateau effect distribution method, as they are user-determined variables" (see Office Action, page 10, lines 3-4).

Applicants respectfully disagree with such assertions by the Examiner.

Roeder only discloses that PZT film properties vary with Zr/(Zr+Ti) ratios and A/B ratios in the precursors.

Both the Zr/(Zr+Ti) ratio and A/B ratio as disclosed by **Roeder** are **compositional variables** relating to the precursor compositions, **which are fundamentally different from non-compositional variables** such as temperature and pressure.

The disclosure of **Roeder** is limited to the impact of such compositional variables on PZT film properties, and it does not extrapolate to non-compositional variables, much less to user-determined variables in general.

Therefore, the Examiner's assertion that **Roeder** teaches determination of "user-determined variables" for optimizing the PZT film properties is an unsupported and impermissible generalization of the actual disclosure by Roeder, which cannot be used to establish a *prima facie* case of obviousness.

As a matter of fact, nothing in **Roeder** teaches or suggests, either expressly or implicitly, establishment of a correlative empirical matrix containing plots of ferroelectric polarization, leakage current density, and atomic percentage lead as a function of temperature, as required by claims 38-56, 60, 62, and 65-68 of the present application; further, nothing in **Roeder** teaches or suggests establishment of correlative empirical matrix plots of ferroelectric polarization, leakage current density, and atomic percentage lead as a function of pressure, as required by claims 38-56, 60, 62, and 65-68 of the present application.

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Neither of the other cited references, Satoh or Miller, remedies such deficiencies of Roeder.

Applicants' claimed invention as recited in claims 38-56, 60, 62, and 65-68 of the present application thus are patentably distinguished over all of the cited references Satoh, Roeder, and Miller.

Patentability of Claims 57 and 58

Both claims 57 and 58 expressly recite:

> "forming the film by liquid delivery MOCVD on the substrate under **MOCVD conditions including temperature, pressure and liquid precursor solution A/B ratio determined by plateau effect determination from a correlative empirical matrix of plots of each of ferroelectric polarization, leakage current density and atomic percent lead in PZT films, as a function of each of temperature, pressure and liquid precursor solution A/B ratio**..."

Like claims 38-56, 60, 62, and 65-68, claims 57 and 58 require a correlative empirical matrix that **concurrently** contains:

(1)   at least one plot of <u>ferroelectric polarization</u> as a function of <u>temperature</u>;

(2)   at least one plot of <u>ferroelectric polarization</u> as a function of <u>pressure</u>;

(3)   at least one plot of <u>ferroelectric polarization</u> as a function of <u>liquid precursor solution A/B ratio</u>;

(4)   at least one plot of <u>leakage current density</u> as a function of <u>temperature</u>;

(5)   at least one plot of <u>leakage current density</u> as a function of <u>pressure</u>;

(6)   at least one plot of <u>leakage current density</u> as a function of <u>liquid precursor solution A/B ratio</u>;

(7)   at least one plot of <u>atomic percent lead</u> as a function of <u>temperature</u>;

(8)   at least one plot of <u>atomic percent lead</u> as a function of <u>pressure</u>; **and**

(9)   at least one plot of <u>atomic percent lead</u> as a function of <u>liquid precursor solution A/B ratio</u>.

Therefore, claims 57 and 58 also patentably distinguish over all of the cited references, for the same reasons discussed hereinabove in connection with the patentability of claims 38-56, 60, 62, and 65-68.

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Applicants hereby request the Examiner to reconsider, and upon reconsideration to withdraw, the rejection of all pending claims 38-58, 60, 62, and 65-68 of the present application.

CONCLUSION

Based on the foregoing, pending claims 38-58, 60, 62, and 65-68 of the present application are in form and condition for allowance. The Examiner therefore is respectfully requested to issue a Notice of Allowance.

No fee is deemed to be necessary for this Response. Nevertheless, the Office is hereby authorized to charge any fees determined to be properly payable for entry of this Response, to Deposit Account 08-3284 of Intellectual Property/Technology Law.

If any issues remain outstanding, incident to the formal allowance of the application, the Examiner is requested to contact the undersigned attorney at (919) 419-9350 to discuss same, in order that this application may be allowed and passed to issue at an early date.

Respectfully submitted,

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